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FINAL REPORT

on

JOB SKILLS EDUCATION PROGRAM

TRADOC TEST PLAN

by

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The Job Skills Education Program (JSEP) Test Plan is a result of a TRADOC initiative to determine if job related academic skills taught using the JSEP computer based instruction (CBI) curriculum helps soldiers acquire and retain job related skills. TRADOC tested the hypotheses on soldiers in AIT and 120 days after completed AIT. TRADOC used seven MOSs representing combat arms, combat services, and combat services support at six TRADOC installations. We matched soldiers and assigned them to control or experimental groups, with the experimental group receiving JSEP lessons and both groups tested with an Army Research Institute developed Job-Relevant Knowledge Test for specific MOSs. The Education Division's analysis of the data, based on grouping soldiers by percent of JSEP lessons complete within the experimental group and compared to our control group, showed significant effects between JSEP instruction, degree of prescription completed and severity of prescription, and immediate results on the ARI test.

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JOB SKILLS EDUCATION PROGRAM

TRADOC TEST PLAN REPORT

Executive Summary

The Job Skills Education Program (JSEP) Test Plan is a result of a TRADOC initiative to determine if job related academic skills taught using the JSEP computer based instruction (CBI) curriculum helps soldiers acquire and retain job related skills. The evaluation of JSEP conducted by American Institutes for Research from January through April 1988 was not able to provide sufficient answers to questions for TRADOC to adopt JSEP as a curriculum delivery system for basic skills instruction. Prior to implementing JSEP, TRADOC conducted an evaluative study of JSEP based on the following hypotheses:

a. Soldiers participating in JSEP will demonstrate acquisition of job skills.

b. Soldiers participating in JSEP will demonstrate retention of job skills.

We tested the hypotheses on soldiers in AIT and 120 days after completion of training. Our research into previous studies on skill retention assured us that 120 day retention study would be significant.

We decided on seven MOSs representing combat arms, combat services, and combat services support at six TRADOC installations. We matched soldiers and assigned them to control or experimental groups, with the experimental group receiving JSEP lessons and both groups tested with an Army Research Institute developed Job-Relevant Knowledge Test for specific MOSs.

TRADOC Analysis Command (TRAC) at White Sands Missile Range agreed to analyze the data we collected during the Test Plan. Their initial analysis of data in September 1989 demonstrated marginal significance based on grouping soldiers by MOS. Our subsequent analysis of the data, based on grouping soldiers by percent of JSEP lessons complete within the experimental group and compared to our control group, showed significant effects between JSEP instruction, degree of prescription completed and severity of prescription and immediate results on the ARI test.

Most of the data in the subsequent analysis was available during the initial analysis. The primary differences in the initial and subsequent analysis was due to more logical grouping of the data. Additionally, thirteen follow-up test results were available for the subsequent analysis that were not received at the time of the initial TRAC analysis.

Inferential statistical analysis of the data based upon TRAC's grouping of results by MOS was hampered by too few degrees of freedom. Conversion of scores to percentage allowed us to view levels of intervention and levels of prescription for effects and relationships ignored in the preliminary TRAC analysis.

By using the comparison group data, we were able to regress to a common start point for both the experimental and comparison groups creating a theoretical expected learning regression. Since ideal conditions are that every soldier complete all JSEP lessons prescribed, we were able to block on both of these variables in an analysis of variance to extract information on effects and relationships key to understanding the dynamics of the JSEP process.

ACKNOWLEDGMENTS

The Education Division is grateful to the many people who contributed their time and effort to the JSEP Test Plan project. We would like to acknowledge those who formulated the project and defined/refined the scope of the project. These individuals gave us the latitude to do what was necessary to bring the project to a successful conclusion. They are Dr. Bill Mitzel, Bob Lord and Joe Crosswell.

We asked for, and received, invaluable assistance from Army Research Institute in procuring the tests we used, matching tasks with test questions, and many other details of pulling materials together for the Test. Sally Bell provided this excellent assistance to us.

TRADOC Analysis Command (TRAC) at White Sands Missile Range provided us with the initial statistical analysis of all our data. We appreciate the fine work and assistance provided by Dr. Dale Dannhaus and Ed Saia.

The Education Services Officers and their assistants at each installation where we conducted the Test provided us tremendous assistance in selecting our two groups, getting soldiers through the JSEP lessons and collecting the data we needed on each soldier.

The Test Plan could not have begun with out the excellent coordination we received from the TRADOC Enlisted Training Directorate. They found time on an already limited AIT/OSUT training schedule for us to conduct the Test Plan. We gratefully acknowledge their assistance from the inception of the Test.

Finally, the greatest acknowledgment goes to Bert Huggins from our TRADOC staff who lent us his psychometric prowess, and provided excellent and timely data analysis expertise at the conclusion of the Test Plan.

FINAL REPORT

on

Job Skills Education Program

TRADOC Test Plan

INTRODUCTION

The evaluation of JSEP conducted by American Institutes for Research, under contract from Army Research Institute from January to April 1988, could not determine what effect JSEP had on soldiers job performance. The purpose for developing JSEP was to improve soldiers job performance yet, at the conclusion of lesson development and the formative evaluation, we did not know if JSEP had the desired effect on soldiers. In order to get an answer to this question the Education Directorate, TRADOC, developed a test plan with the hypotheses that JSEP is a cost effective program to improve the acquisition and retention of soldiers job skills.

We used soldiers in Advanced Individual Training (AIT) for our Test Plan since this was where all soldier's would be acquiring a majority of the job tasks required in their particular MOS. The retention portion of our Test Plan measured soldiers' skills approximately 120 days after completion of training when the soldier was at the first permanent duty station. The "cost effective" reference in our hypothesis is to the time and money required to provide JSEP to soldiers. In order for JSEP to be cost effective, we expect to see measurable increases in job performance. Time constraints did not permit us to conduct a longitudinal study and track soldiers two or three years after receiving JSEP. However, our research into previous studies on skill retention assures us that 120 day study of retention is significant.

TEST DESIGN AND DATA COLLECTION

We decided on seven MOS to use in the test plan: 11B, 12B, 71L, 76Y, 88M, 94B and 95B. The seven MOS represent combat arms, combat services, and combat services support. Our reasons for using these seven MOS were: over seventy percent of MOS tasks are taught in AIT; schools have sufficient students per cycle; all schools are in TRADOC; ARI has developed task proficiency tests (described below) for MOS that can be used as end-of-course tests; start dates for AIT/OSUT were compatible with time frame of the test plan; and PLATO terminals to deliver JSEP lessons were available in sufficient quantities for the number of soldiers needed for the test plan. The MOS in the test plan were at the following six TRADOC installations: Forts Benning, Dix, Jackson, Lee, McClellan, and Leonard Wood.

We could not test JSEP on highly technical MOS because the length of these AIT would extend the test plan beyond the scheduled dates. The Test Plan, as designed, could not consider AIT over 9 weeks in duration.

We used only CAT IIIa, IIIb, and IV active Army soldiers. We selected two matched groups of 100 soldiers each to be in a control and experimental group. We matched soldiers within the two groups based on the following: sex, race, AFTQ (or GT), ASVAB subtest score required of MOS, JSEP test scores, and educational level.

The first step in beginning the test plan was for installation education services officers (ESO) to test all soldiers in mental category III and IV who were in a designated AIT/OSUT cycle during the period March - April 1989. All sites used the JSEP diagnostic tests, along with other data described above, for matching soldiers into control and experimental groups. The JSEP Test we used was a 195 item paper based test that does not test all prerequisite competencies in a soldiers' MOS prescription. However, the JSEP lesson developer validated the test items for most JSEP lessons. Since the JSEP lesson developer never delivered a diagnostic test with the lessons, we had to use this test knowing its limitations.

The group designated experimental was given the JSEP prescription for their MOS and received JSEP instruction on only those tasks they are deficient in based on the diagnostic test. ESO working closely with training battalions scheduled JSEP lessons for approximately two hours per evening, five evenings each week of AIT/OSUT. Some Education Centers opened at special times to accommodate the soldiers while in training. In order to give soldiers a chance to complete their prescription of lessons, we suggested a minimum of 50 hours from the AIT/OSUT schedule. Time made available ranged from 36 to 54 hours with 47 hours being the average.

At the end of AIT/OSUT the ESOs gave both the experimental and control groups MOS proficiency tests developed by ARI. ARI refers to the 19 tests as Job Relevant Knowledge Tests. We used the seven tests that corresponded to the MOS in our Test Plan. The tests measure cognitive components of formal training experiences, specifically AIT and are meant to predict first and second term job performance. The tests, even though just released by ARI to TRADOC for use in March 1989, were deemed to be the best measure of job skills taught in the training base. According to ARI research findings, all of the tests have relatively high reliability coefficients (mean alpha was .88 across all tests).

Data collected in 1983 during the Task Analysis phase of JSEP development, and stored at TRADOC, enabled us to locate the soldier's tasks on which each JSEP lessons is based. We then identified the soldier's tasks ARI used to develop their Job-Relevant Knowledge Test questions. Finally, we matched the tasks used for JSEP lessons with the tasks taught in AIT/OSUT.

This enabled us to verify the relation between JSEP lessons and what was tested on the ARI test with what was being taught in AIT/OSUT.

The results from the ARI Job-Relevant Knowledge Tests helped us test our first hypothesis which is: JSEP is a cost effective program to improve soldiers acquisition of job skills. The measure of cost effectiveness was the time taken out of the training schedule for JSEP was worthwhile if the soldier improves knowledge of job tasks.

One hundred-twenty days after soldiers left AIT/OSUT, we queried the DA Enlisted Master File to locate soldiers at their duty station for follow-up testing which would be approximately 120 days after AIT/OSUT. We sent the ARI Job Relevant Knowledge Test to ESOs at the soldiers' duty station with instructions to administer the test and return to us for scoring. We matched this score to the results of tests given at the end of AIT/OSUT, for both groups, to see if those taking JSEP retained skills longer than the control group that received no JSEP instruction. This tested the second part of our hypothesis: retention.

RESULTS OF THE TRADOC TEST PLAN

At TABLE 1 is a profile of the experimental and control groups that we collected data on for the Test Plan. JSEP lessons were not assigned until soldiers entered AIT portion of training. The time allotted for JSEP lessons on the PLATO computer system varied at each installation. Some installations arranged for lessons to be given during the duty day, others in the evenings. All groups, except the 71L at Fort Jackson, had specific hours they could work on lessons. 71L had 50 hours allotted, but were given an unlimited amount of time to complete all of lessons prescribed. Also, 71L received the full prescription of MOS lessons which resulted in up to 80 lessons being assigned.

TABLE 1
PROFILE OF EXPERIMENTAL AND CONTROL GROUPS

MOS	EXPERIMENTAL N	CONTROL N	LENGTH AIT/OSUT	TIME ALLOTTED	MEAN JSEP LESSONS
11B	22	22	13 wk	50 hr	34
12B	5	4	13 wk	36 hr	26
71L	14	17	9 wk	50*	47
76Y	17	10	7 wk	54 hr	17
88M	24	25	8 wk	44 hr	32
94B	17	16	9 wk	46 hr	32
95B	4	4	16 wk	53 hr	22
Total	98	103			

ESOs assigned soldiers to the experimental and control groups so that an equal number were in each group. As seen in TABLEs 1 and 2, there are different numbers in the two groups. This is a result of minor and insignificant mortality between the time soldiers were assigned to a group and the first ARI test at the end of AIT/OSUT.

TRADOC Analysis Command (TRAC) conducted the analysis by MOS groups (TABLE 2) based on the results of the first ARI Job Relevant Knowledge Tests. TRAC analyzed the experimental group data to determine if there is a relationship between the number of JSEP lessons completed and the ARI total test score results. It showed JSEP benefited the 71L MOS personnel. This correlation was significantly different from zero (P<.05). It shows that soldiers who completed more JSEP lessons tended to have higher ARI total scores. The failure to identify significance by MOS is in direct relationship to the small n-size artificially created by analysis by MOS.

TABLE 2
TRAC ANALYSIS OF ARI TEST RESULTS BY MOS

OS	PERCENT CORRECT CONTROL	PERCENT CORRECT EXPER	t-VALUE	SIG	N*		STANDARD DEVIATION*	
1B	50.0%	53.6%	1.44	NS	22	22	9.7	6.6
2B	56.0%	54.0%	.31	NS	5	4	10.0	9.0
1L	49.9%	57.7%	2.17	P<.05	14	17	12.3	7.7
6Y	60.1%	54.7%	1.04	NS	17	10	7.0	15.6
8M	50.3%	52.5%	.97	NS	24	25	8.9	6.7
4B	44.5%	53.8%	1.49	NS	17	16	10.1	16.7
5B	55.3%	54.8%	.08	NS	4	4	8.5	10.1

* The first number represents the control group while the second number represents the experimental group.

TRADOC expanded the TRAC analysis to overall comparison of experimental and control groups, the results of which follows in TABLE 3. The two groups are the same with the exception of the intervention of JSEP lessons on the experimental group. We found a significant difference (<.05) between the experimental and control groups. Scores reflected in the Mean column represent the percent of answers correct on the ARI Job-Relevent Knowledge Tests. We equalized the seven MOSs in the experimental group by using percent of answers correct since the number of questions on each of the seven ARI MOS Tests varied. The experimental group in TABLE 3 demonstrates a decline in group variance as represented by the standard deviation (S.D. 10.22).

TABLE 3

FIRST ARI JOB-RELEVANT KNOWLEDGE TEST

GROUP	N	MEAN	S.D.	MEAN DIF.	t=
Experimental	98	54.21	10.22	3.27	2.06*
Control	103	50.94	12.17		

* Significant at <.05 level (P=0.041).

Table 4 demonstrates the results of the second ARI Test 120 days after AIT/OSUT. Data generated from the second test provided the information we needed for the retention portion of our hypothesis. ESOs throughout the Army were able to contact about half of each group for the second test. We found 13 soldiers from our groups had separated from the Army by the time we queried the Enlisted Master File at DA for permanent duty station addresses.

TABLE 4

SECOND ARI JOB-RELEVANT KNOWLEDGE TEST

	N	MEAN	S.D.
Experimental	50	57.16	8.41
Comparison *	47	59.68	9.03

* The use of the term "comparison" recognizes loss of control group characteristics through experimental mortality. Beyond the first posttest, there was no attempt to equalize differences between groups.

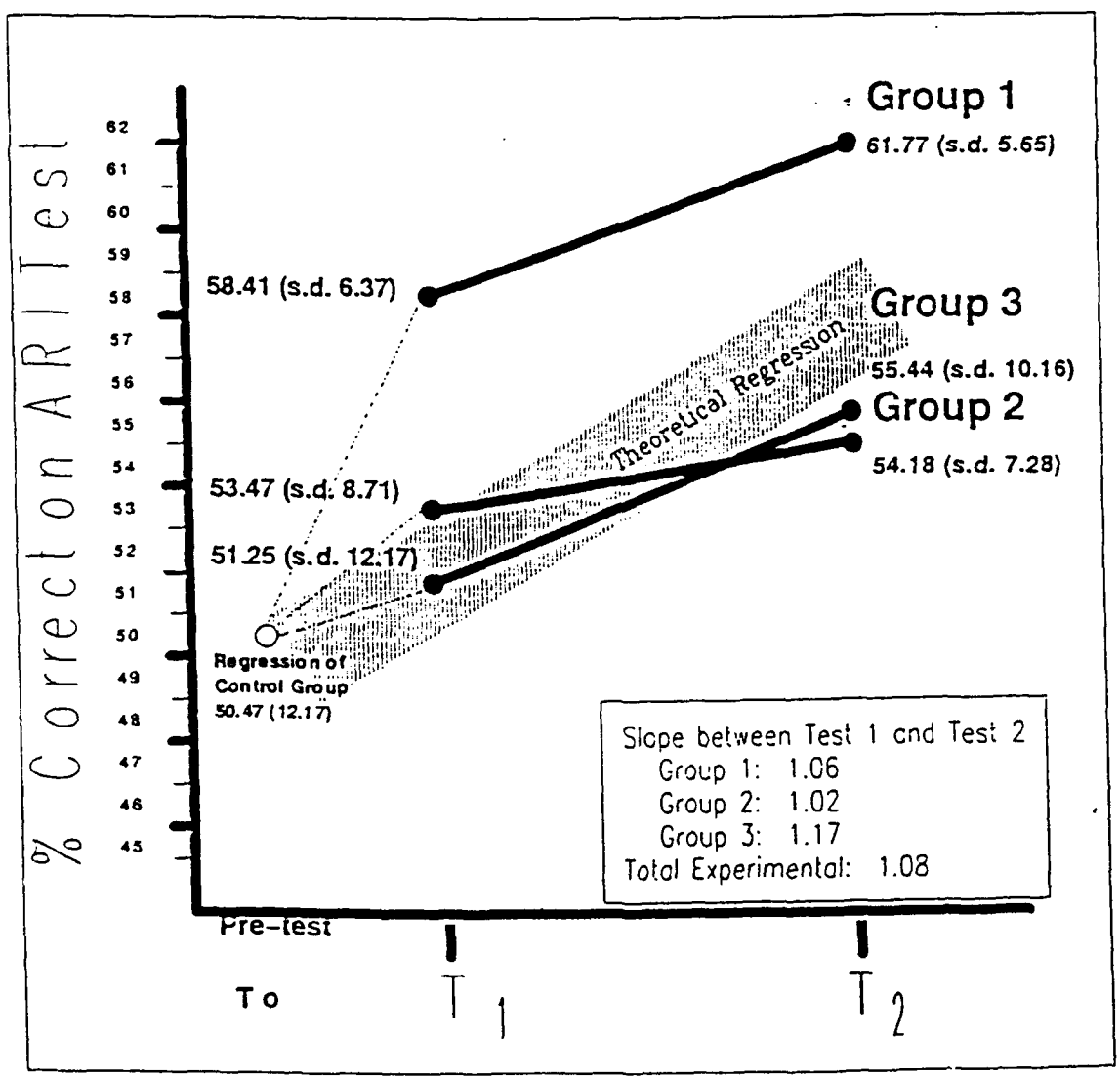
As demonstrated in TABLE 5, we divided the Experimental Group into three subgroups in order to analyze the effects of the number of JSEP lessons on soldiers since participants did not have the benefit of completing all of their individual prescription assigned by the JSEP Management System. The percentage of lessons completed is by each Subgroup is as follows: Subgroup 1 = 96 to 100%; Subgroup 2 - 86 to 95%; Subgroup 3 - 85 to 21 %. The shaded area represents the theoretical regression of the comparison group.

Also, TABLE 5 displays the comparison of the three subgroups that make up the experimental group and shows the improvement among the groups from Test 1 to Test 2. Positive slope of all experimental subgroups demonstrates increase of JSEP-like skills in the work environment. Such an increase indicates a high content validity of the JSEP curriculum.

TABLE 5

COMPARISON OF SUBGROUPS TEST 1 (TI) TO TEST 2 (T2)

Membership Determined by % of Prescription Completed



We performed a One-Way ANOVA on the experimental groups, (TABLE 6), that represents the two test administrations, T1 and T2, approximately 120 days apart. The significance of the ANOVA demonstrates that group completion of all or nearly all of the prescription contributes greatly to homogeneity, and conversely, completing fewer prescribed lessons (or none) increases ingroup variance. Another significant finding is that differences between the subgroup completing all or nearly all of the prescription and other subgroups grew over time beyond the intervention. As demonstrated by the highly significant finding at T_2, the effects of JSEP last well beyond the initial impact of the instruction.

TABLE 6

ONE-WAY ANOVA

	MEAN			MS	ERROR	F(2.47)
	Group 1	Group 2	Group3			
Test 1	58.41	53.47	55.44	223.49	85.60	2.61 *
Test 2	61.76	54.18	55.44	279.70	61.86	4.52 **

* Significant at P=0.08 (marginal finding)
** Significant at P=0.02

CONCLUSION

Our hypotheses that JSEP is a cost effective method of soldiers acquiring and retaining job related basic skills were proven true. Our findings indicate that soldiers who participate in JSEP will out perform nonparticipants on targeted skills. Secondly, the demonstrated effects of job skills training will be higher in targeted skills with JSEP preparation. Third, the effect of JSEP ties directly to the percent of lessons completed by the soldier.

Soldiers who have the benefit of JSEP instruction and are allotted the time to complete the entire prescription of JSEP lessons assigned, do perform significantly better in job tasks and continue to make significant gains as they apply that knowledge to the job setting over time than soldiers who do not take JSEP. There is a significant positive relationship between the number of JSEP lessons completed and job performance of soldiers as noted between groups in our Test Plan (experimental and comparison as well as within the three subgroups of experimental soldiers).

Considering the results of the JSEP Test Plan, and the results of the JSEP Test for Artillery Career Management Field (CMF 13) concluded in July 1990, we support and will recommend that learning centers with PLATO capabilities adopt the JSEP curriculum as the primary mode for delivering basic skills lessons and the Army pursue alternate CBI delivery systems for JSEP.

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